Bioinformatics in Agriculture

Tools and Applications

editors:

M. Balakrishnan
S. Dam Roy

Bioinformatics in Agriculture

Tools and Applications

M. Balakrishnan
Senior Scientists, (ICM Division)
National Academy of Agricultural Research Management
Rajendranagar, Hyderabad – 500 030
Andhra Pradesh

S. Dam Roy
Director (CARI)
Central Agricultural Research Institute
Port Blair – 744 101, Andaman & Nicobar Islands

NEW INDIA PUBLISHING AGENCY
New Delhi – 110 034

NEW INDIA PUBLISHING AGENCY
101, Vikas Surya Plaza, CU Block, LSC Market
Pitam Pura, New Delhi 110 034, India
Phone: + 91 (11)27 34 17 17 Fax: + 91(11) 27 34 16 16
Email: info@nipabooks.com
Web: www.nipabooks.com

Feedback at feedbacks@nipabooks.com

© Editors, 2014

ISBN: 978-93-81450-92-5

All rights reserved, no part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission of the publisher or the copyright holder.

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the author/s, editor/s and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The author/s, editor/s and publisher have attempted to trace and acknowledge the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission and acknowledgements to publish in this form have not been taken. If any copyright material has not been acknowledged please write and let us know so we may rectify it, in subsequent reprints.

Trademark notice: Presentations, logos (the way they are written/presented), in this book are under the trademarks of the publisher and hence, if copied/resembled the copier will be prosecuted under the law.

Composed, Designed and Printed in India

Contents

Foreword ..... *v*

Preface ..... *vii*

Contributors ..... *ix*

1. **Application of Bioinformatics in Agriculture** **1**
   D. Velmurugan

2. **Statistical Data Mining-Concepts, Tools and Techniques for Bioinformatics** . **13**
   Ravi R. Saxena, Ritu R. Saxena, Akash Solanki and M.L. Lakhera

3. **Prediction of 3D – Structure of Proteins Using Artificial Neural Networks** .. **27**
   K. Meena

4. **A Genomic Approach to Study the Insect Mitochondrial Evolution by Non coding LSU and SSU rRNA** **41**
   S. Gifta Lorraine, Christy Jancy Joy P., Arul Samraj D. and Priyakumari Joyce C.

5. **Analysis of Microarray Gene Expression Data** **47**
   M. Balakrishnan, R.C. Srivastava and M. Ramachandran

6. **A Novel Sequence Encoding Method for Searching Rareness Among Consensus DNA Sequences** **59**
   K. Meena, K. Menaka, T.V. Sundar and K. R. Subramanian

7. **Statistical Methods for Genomic Sequence and Microarray Analysis** **65**
   A.K. Roy and S.R. Martha

8. **Significance of Insect Genomics in Agro Ecosystems** **79**
   R.W. Alexander Jesudasan

9. **Bioinformatics Tools in Fish Molecular Modeling** **87**
   Grinson George, K.Sarma, S. Dam Roy and Mukunda Goswamy

10. **Structural Bioinformatics Goals and Challenges** **103**
    Mayank Pokhriyal and M. Balakrishnan

11. **Database for Animal Genetic Resources of A &N Islands** **107**
    M. Balakrishnan, S. Jeyakumar, R.C. Srivastava, Mayank Pokhriyal and Soma Mondal

12. A Database for Medicinal Plants used in Treatment of Asthma 111
K. Balaji, M. Rajadurai, G. Vidhya, A. Krithika, E. Hudson, Vidya Murali, M. Ramya, Anusha Bhaskar and V. Stanley

13. *In-silico* Determination of Potential Drug Target for Curing Meningococcal Disease- Bioinformatics Study On Penicillin- Binding Proteins 115
Vijay Tripathi, Dwijendra Gupta and Navita Srivastava

14. Text Mining: Potential Applications in Bioinformatics 121
M. Balakrishnan, R.C. Srivastava, S.K. Zamir Ahmed and Subhash Chand

15. Diversity and Antibacterial Activity of Coral Associated Actinomycetes 125
P. Nithyanand, S. Manju and S. Karutha Pandian

16. Decision Tree and its Application in Bioinformatics 131
Rajni Jain and Amarendra Kumar Mishra

17. Database for Algae Resources in Andaman and Nicobar Islands 143
M. Balakrishnan

18. Bioinformatics of Natural Antiniotics 147
S. Rajarajan, M. Yogambal, K. Sangeetha

19. PhytopathoSys v1.0 – A Phytopathology Information System 165
M. Balakrishnan, R.C. Srivastava, Michael Imanual Jesse and M. Ramachandran

20. Multiple Gene Expression Profiles of Chemically Induced Parkinson Disease: Implication in Neuroprotection Mechanism Offered by Nicotine and Caffeine 171
Kavita Singh, M.P. Singh and M. Balakrishnan

21. Development of Databases on Freshwater Aquaculture 187
A.K. Roy and Nibedita Jena

22. Proteomics and Bioinformatics 199
A. Subash Chandira Bose, R. Venkateshwaran and M. Balakrishnan

23. Data Mining and its Applications in Bioinformatics 205
Soma Mondal and M. Balakrishnan

24. Molecular Phylogenic Location of the Indian Liver Fluke, *Fasciola* (Trematoda: Fasciolidae) Based on The Ribosomal Internal Transcribed Spacer Regions 209
P. K. Prasad, V. Tandon, D.K. Biswal, L.M. Goswami and A. Chatterjee

25. Prediction of Amino Acid Levels in Protein Sequences Using Artificial Neural Networks 219
K.Meena and M. Manimekalai

26. Applying New Data Mining Method of Rough Sets to Predict Protein Structural Class 227
K. Meena and M. Durairaj

27. Plant Systems Biology 239
G. Ramesh Kumar, CP Rajadurai and M. Ramachandran

28. Bio-efficacy of Indigenous *Bacillus thuringiensis* LDC-9 Against Insect Pest and its Characterization through *In-silico* Approach 253
R. Shenbagarathai and A. Mahalakshmi

29. Molluscan Resources and Its Management Measures in Andaman & Nicobar Islands 273
S.N. Sethi, M. Balakrishnan, S. Chand and B.Varghese

Bioinformatics in Agriculture

Tools and Applications

Readership : Meant for all related to bioinformatics, biotechnology, agricultural sciences, computer science and applied statistics.

The book deals with various tools and applications of bioinformatics in the fields of :

- agriculture, corals, structural bioinformatics, data-mining, text-mining;
- medicinal plants, antibiotics, protein structure prediction, drug design;
- gene expression, micro-arrays, proteomics, molecular phylogenic location of the Indian Liver Fluke, rough sets to predict protein structural class;
- artificial neural networks for prediction of amino acids levels, plant systems biology, molecular modeling, homology modeling, bio-efficacy of indigenous bacillus through in-silico approach;
- fresh aquaculture and fisheries, pesticides and insecticides, databases and tools development in the relevant area.

The book would be of much use to the person working in the field of agricultural biotechnology, bioinformatics, computer science and applied statistics. This can act as a book for M.Sc, M.Tech and Ph.D students of and the faculty of Bioinformatics/Biotechnologists.

M. Balakrishnan: Senior Scientists, ICM Division, NAARM-ICAR, Rajendranagar, Hyderabad – 500 030, Andhra Pradesh, India

S. Dam Roy: Director, CARI-ICAR, Port Blair – 744 101, Andaman & Nicobar, Islands

NEW INDIA PUBLISHING AGENCY
101, Vikas Surya Plaza, CU Block, L.S.C.Market
Pitam Pura, New Delhi-110 034, India
Tel. : +91(11) 27341717, Fax : +91(11) 27341616
E-mail : info@nipabooks.com
Web : www.nipabooks.com

ISBN 9789381450925